

**BEFORE THE
PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA
DOCKET NO. 2013-1-E**

In the Matter of)	DIRECT TESTIMONY OF
Annual Review of Base Rates)	JOSEPH A. MILLER, JR. FOR
for Fuel Costs for)	DUKE ENERGY PROGRESS, INC.
Duke Energy Progress, Inc.)	

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Joseph A. Miller, Jr. and my business address is 526 South Church
3 Street, Charlotte, North Carolina 28202.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am General Manager of Strategic Engineering for Duke Energy Business Services,
6 LLC (“DEBS”), which is a service company subsidiary of Duke Energy Corporation
7 (“Duke Energy”) that provides services to Duke Energy and its subsidiaries,
8 including Duke Energy Progress, Inc. (“DEP” or “the Company”).

9 **Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND**
10 **PROFESSIONAL BACKGROUND.**

11 A. I graduated from Purdue University with a Bachelor of Science degree in
12 mechanical engineering. I also completed twelve post graduate level courses in
13 Business Administration at Indiana State University. My career began with Duke
14 Energy (d/b/a Public Service of Indiana or “PSI”) in 1991 as a staff engineer at Duke
15 Energy Indiana’s Cayuga Steam Station. Since that time, I have held various roles
16 of increasing responsibility in the generation engineering, maintenance, and
17 operations areas, including the role of station manager, first at Duke Energy
18 Kentucky’s East Bend Steam Station, followed by Duke Energy Ohio’s Zimmer
19 Steam Station. I was named General Manager of Analytical and Investments
20 Engineering in 2010, and was named to my current role in July 2012 following the
21 merger between Duke Energy and Progress Energy, Inc.

1 **Q. WHAT ARE YOUR DUTIES AS GENERAL MANAGER OF STRATEGIC**
2 **ENGINEERING?**

3 A. My responsibilities include environmental compliance planning and strategy, fuel
4 flexibility, assessment of new technology developments, and analysis of plant
5 retirements and new fossil generation for the Company's fleet of fossil and
6 hydroelectric ("hydro" and collectively, "fossil/hydro") facilities.

7 **Q. HAVE YOU TESTIFIED BEFORE THIS COMMISSION IN ANY PRIOR**
8 **PROCEEDINGS?**

9 A. Yes. I testified before this Commission in Duke Energy Carolinas, LLC's 2012
10 annual fuel proceeding in Docket No. 2012-3-E. I have also testified on behalf of
11 Duke Energy in proceedings before other state commissions, most recently in
12 January 2013.

13 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
14 **PROCEEDING?**

15 A. The purpose of my testimony is to (1) describe DEP's generation portfolio and
16 changes made since the prior year's filing, as well as those expected in the near term,
17 (2) discuss the performance of DEP's fossil/hydro facilities during the period of
18 March 1, 2012 through February 28, 2013 (the "review period"), (3) provide
19 information on significant outages that occurred during the review period, and (4)
20 discuss DEP's environmental compliance efforts.

1 **Q. PLEASE DESCRIBE THE COMPANY’S FOSSIL/HYDRO GENERATION**
2 **PORTFOLIO.**

3 A. The Company’s fossil/hydro generation portfolio consists of 9,365¹ megawatts
4 (“MWs”) of generating capacity, made up as follows:

5	Coal-fired -	4,095 MWs
6	Hydro -	225 MWs
7	Combustion Turbines -	3,041 MWs
8	Combined Cycle Turbines -	2,004 MWs

9 The coal-fired fleet consists of four generating stations and a total of ten
10 units. These units are equipped with emission control equipment, including
11 selective catalytic or selective non-catalytic reduction (“SCR” or “SNCR”)
12 equipment for removing nitrogen oxides (“NOx”), and flue gas desulfurization
13 (“FGD” or “scrubber”) equipment for removing sulfur dioxide (“SO₂”). In addition,
14 nine coal-fired units are equipped with low NOx burners. This inventory of coal-
15 fired assets with emission control equipment employed enhances DEP’s ability to
16 maintain current environmental compliance and concurrently utilize coal with
17 increased sulfur content – providing flexibility for DEP to procure the best cost
18 options for coal supply.

19 The Company has a total of 36 simple cycle combustion turbine (“CT”)
20 units, of which 14 are considered the larger group, providing approximately 2,241
21 MWs of capacity. These 14 units are located at Asheville, Darlington, Richmond
22 County, and Wayne County. Within the fleet of 36, 14 units have NOx control
23 equipment. The 2,004 MWs shown as “Combined Cycle Turbines” (“CC”)

¹ As of 4/1/2013 – includes retirements for early 2013.

1 represent three power blocks. The Lee Energy Complex has a configuration of three
2 CTs and one steam turbine, and Richmond County has two power blocks consisting
3 of two CTs and one steam turbine. Within these power blocks, the seven CTs are
4 equipped with low NOx burners, SCR equipment, and carbon monoxide volatile
5 organic compound catalysts. The steam turbines do not combust fuel and, therefore,
6 do not require NOx controls. Additionally, DEP's hydro fleet consists of 15 units
7 providing approximately 225 MWs of capacity.

8 **Q. WHAT CHANGES HAVE OCCURRED WITHIN THE FOSSIL/HYDRO**
9 **PORTFOLIO SINCE DEP'S 2012 FUEL FILING?**

10 A. Changes within the portfolio include the addition of a combined cycle facility
11 providing 920 MWs of capacity at the Lee Energy Complex ("Lee CC"), which
12 went in-service on December 31, 2012, and is located in Goldsboro, North Carolina.
13 Also within the review period, DEP retired coal-fired units 5 and 6 at Cape Fear,
14 Units 1, 2 and 3 at Lee, and Unit 1 at Robinson. These coal retirements in
15 September and October 2012 reduced capacity by 875 MWs, retiring units that
16 began commercial operations from between 1951 and 1962. The CT fleet was
17 reduced by a total of 144 MWs with the October 2012 and March 2013 retirement of
18 units at Cape Fear and Lee that all began commercial operation between 1968 and
19 1971. A combination of criteria went into the decisions to retire these units,
20 including the economics of meeting environmental controls and the obsolescence of
21 equipment.

1 **Q. ARE OTHER CAPACITY CHANGES EXPECTED WITHIN THE**
2 **FOSSIL/HYDRO PORTFOLIO BY THE END OF THE BILLING PERIOD?**

3 A. Yes, another combined cycle facility is under construction in New Hanover County,
4 North Carolina (the “Sutton CC”). The Sutton CC will provide an additional 625
5 MWs of capacity and is scheduled to be in service by December 2013. Also at the
6 Sutton facility, coal-fired Units 1, 2 and 3 that began operation in 1954, 1955, and
7 1972, respectively, are scheduled for retirement by the end of 2013.

8 **Q. WHAT ARE DEP’S OBJECTIVES IN THE OPERATION OF ITS**
9 **FOSSIL/HYDRO FACILITIES?**

10 A. The primary objective of DEP’s fossil/hydro generation department is to safely
11 provide reliable and cost-effective electricity to DEP’s Carolinas customers. The
12 Company achieves this objective by focusing on a number of key areas. Operations
13 personnel and other station employees are well-trained and execute their
14 responsibilities to the highest standards in accordance with procedures, guidelines,
15 and a standard operating model. Like safety, environmental compliance is a “first
16 principle” and DEP works very hard to achieve high level results.

17 The Company achieves compliance with all applicable environmental
18 regulations and maintains station equipment and systems in a cost-effective manner
19 to ensure reliability. The Company also takes action in a timely manner to
20 implement work plans and projects that enhance the safety and performance of
21 systems, equipment, and personnel, consistent with providing low-cost power
22 options for DEP’s customers. Equipment inspection and maintenance outages are
23 scheduled during the spring and fall months when electricity demand is reduced due

1 to weather conditions. These outages are well-planned and executed with the
2 primary purpose of preparing the unit for reliable operation until the next planned
3 outage.

4 **Q. WHAT HAS BEEN THE HEAT RATE OF DEP'S COAL UNITS DURING**
5 **THE REVIEW PERIOD?**

6 A. Heat rate is a measure of the amount of thermal energy needed to generate a given
7 amount of electric energy and is expressed as British thermal units ("Btu") per
8 kilowatt-hour ("kWh"). A low heat rate indicates an efficient fleet that uses less heat
9 energy from fuel to generate electrical energy. Over the review period, the average
10 heat rate for the coal fleet was 10,856 Btu/kWh. The most active units at Asheville,
11 Mayo, Roxboro, and Sutton achieved a heat rate of 10,844 Btu/kWh and the most
12 efficient two units were Roxboro Units 1 and 2, achieving heat rates of 9,551 and
13 10,204 respectively. The Roxboro units provided the majority (62.5%) of coal-fired
14 generation for DEP.

15 **Q. HOW MUCH GENERATION DID EACH TYPE OF GENERATING**
16 **FACILITY PROVIDE FOR THE REVIEW PERIOD?**

17 A. For the review period, DEP's total system generation was 60,246,019 MW hours
18 ("MWHs"), of which 32,498,898 MWHs, or approximately 54%, was provided by
19 the fossil/hydro fleet. The breakdown includes a 34% contribution from the coal-
20 fired stations, approximately 19% contribution from gas facilities, and
21 approximately 1% from hydro facilities.

1 **Q. PLEASE DISCUSS THE OPERATIONAL RESULTS FOR DEP'S**
2 **FOSSIL/HYDRO FLEET DURING THE REVIEW PERIOD.**

3 A. The Company's coal-fired generating units operated efficiently and reliably during
4 the review period. The Company uses two key measures to evaluate the operational
5 performance of coal-fired generating facilities: (1) equivalent availability factor; and
6 (2) capacity factor. Equivalent availability factor refers to the percent of a given
7 time period a facility was available to operate at full power, if needed. Equivalent
8 availability is not affected by the manner in which the unit is dispatched or by the
9 system demands; however, it is impacted by planned and unplanned (*i.e.*, forced)
10 outage time. Capacity factor measures the generation that a facility actually
11 produces against the amount of generation that theoretically could be produced in a
12 given time period, based upon its maximum dependable capacity. Capacity factor is
13 affected by the dispatch of the unit to serve customer needs.

14 The Company's coal-fired units achieved results of 91.05% equivalent
15 availability factor and 46.65% capacity factor over the review period. During the
16 2012 peak summer season (June through August 2012), the fleet achieved results of
17 97.04% equivalent availability factor and 62.32% capacity factor. Utilizing the
18 North American Electric Reliability Council's ("NERC") Generating Availability
19 Report² ("NERC Report"), the Company's coal fleet compares very well with
20 availability of the units to operate as needed. The most recently published NERC
21 Report represents the period 2007 through 2011 and indicates an average equivalent
22 availability factor of 83.45% for all North American coal plants. The Company's

² Typically, the Company obtains this figure from NERC's Generating Unit Statistical Brochure ("NERC Brochure"). The most recent NERC Brochure, however, has not yet been published, and as a result, the Company utilized the published NERC Report.

1 capacity factor reflects the generation fleet dispatch impact of historically low
2 natural gas pricing, as discussed by Company witness Weintraub.

3 The Company's most active CTs located at Asheville, Darlington, Richmond
4 County, Lee, and Wayne County were available as needed in this time period, with a
5 98.75% starting reliability, outperforming the average of 97.42% reported in the
6 above referenced NERC Report. The Richmond CC facility reported a capacity
7 factor of 73.02% for the review period which also outperformed the NERC Report
8 average of 40.36%. As noted previously, the Lee CC facility began commercial
9 operation in December 2012 and has performed well as a baseload unit in its first
10 two months of operation, achieving a capacity factor of 80.18%, which is also above
11 the NERC average.

12 With an overall availability factor of 97.89%, the hydroelectric fleet had
13 strong operational performance during the review period, and also exceeded the
14 NERC reported average availability factor of 85.22%.

15 These performance results are indicative of safe, high quality operations, and
16 management efforts.

17 **Q. PLEASE DISCUSS SIGNIFICANT OUTAGES OCCURRING AT DEP**
18 **FOSSIL/HYDRO FACILITIES DURING THE REVIEW PERIOD.**

19 A. In general, planned maintenance outages for all fossil and hydro units are scheduled
20 for the spring and fall to maximize unit availability during periods of peak demand.
21 Most of these units had at least one small planned outage during this review period
22 to inspect and maintain plant equipment. The most significant outages occurred in
23 the spring of 2012. Mayo Unit 1 entered a maintenance outage for a turbine flow

1 guide and blading inspection which resulted in the need to complete significant
2 repairs to the flow guides and blading. The Company took advantage of the outage
3 time and performed additional maintenance efforts to ensure on-line reliability once
4 the unit was fully repaired and back in service. These additional maintenance items
5 included performing air heater washes for boilers, fuel handling maintenance and
6 repairs, scrubber maintenance, rewiring of several power supplies, and a boiler feed
7 pump thrust bearing replacement. Also in the spring, Roxboro Unit 1 entered a
8 planned maintenance outage which involved major inspections on the boiler and
9 turbine, and maintenance on the scrubber. More significant projects included coal
10 burner replacements, generator stator rewind, condenser coating, and replacements
11 for the economizer inlet header, scrubber damper, and waterwall tubing.

12 For the CT fleet, the most significant outages occurred at Darlington, Cape
13 Fear, and Wayne County facilities. The Darlington Unit 12 outage was the most
14 significant due to turbine blade failure and subsequent damage. This event began in
15 August of 2011 and is currently on schedule to complete in May 2013. Restoration
16 of this unit involves extensive major work in the inlet, compressor, combustor,
17 turbine, and exhaust sections of the unit. A generator stator rewind was required
18 along with installation of a new generator rotor, and refurbishment of compressor
19 diaphragms, pumps, motors, and valves. Other major restoration work included
20 installation of water injection modification components, refurbishment of blade rings
21 and seal housings, a new exhaust cylinder and exhaust rake, along with replacement
22 of cable and conduit in the exhaust section, installation of refurbished journal
23 bearings, and a new CT rotor and bearings. In addition to restoration, the Company

1 is improving blade path thermocouples, generator controls, modifying exhaust
2 bearing tunnels, and installing new instrumentation to provide improved information
3 and control for operators.

4 Cape Fear Unit 4 experienced an outage resulting from a bearing failure that
5 was deemed uneconomical for repair given the retirement schedule for the unit. An
6 outage at Wayne County involved Unit 1 which exhibited a high vibration trip in
7 June 2012. Disassembly and inspection indicated damage to the mid-compressor
8 case which required refurbishment. Other components, including combustion and
9 turbine hardware and rotor, were also refurbished. The Company installed enhanced
10 compressor blades to increase the compressor reliability. Testing, tuning, and
11 alignments were performed, and the unit was returned to service in December 2012.
12 Substation maintenance, switchyard upgrades and tie-ins, and control room upgrades
13 resulted in planned outages at Blewett, Wayne County, and Weatherspoon.

14 There were planned outages for major turbine work for CC units at
15 Richmond County in the fall of 2012 and maintenance outages in February 2013 for
16 the new Lee CC facility. Within the hydro fleet, significant planned outages
17 included the Blewett Hydro Unit 5, which began a turbine gate rebuild, and Marshall
18 Unit 2, which included a generator turbine inspection and headgate gearbox
19 replacement.

20 **Q. ARE EMISSION-REDUCING CHEMICALS NEEDED FOR USE WITH**
21 **EMISSION-CONTROL EQUIPMENT AT THE COAL-FIRED STATIONS?**

22 **A.** Yes. As discussed above, DEP has installed pollution control equipment on coal-
23 fired units in order to meet various current federal, state, and local reduction

1 requirements for NO_x and SO_x emissions. Each of these technologies requires the
2 presence and consumption of specific chemicals which act as reagents in order for
3 the chemical reaction to occur that greatly reduces the NO_x or SO_x emissions. The
4 SCR technology that DEP currently operates uses ammonia or, in the case of
5 Ashville, urea, which is converted to ammonia for NO_x removal, and the scrubber
6 technology employed by DEP uses crushed limestone for SO₂ removal. Organic
7 acid (often referred to as “DBA” or “dibasic acid”) can also be used with the
8 scrubber technology for additional SO₂ removal. In addition, DEP also uses
9 magnesium hydroxide and calcium carbonate as reagents to mitigate increased SO_x
10 and reduce slag formation in the boiler, which, if allowed to build, can significantly
11 impair plant generation. This use of magnesium hydroxide and calcium carbonate
12 allows DEP to meet increasing environmental standards and manage boiler slag
13 formation in a cost efficient manner.

14 Additionally, DEP is testing the use of other emission-reducing reagents,
15 including, but not limited to, activated carbon, calcium bromide, and re-emission
16 chemicals in order to meet present and future state and federal emission
17 requirements. New advancements in the environmental control arena provide DEP
18 with new and improved emission-reducing chemical opportunities (such as the
19 aforementioned chemicals) that the Company can use to comply with its federal and
20 state environmental obligations, which are ever-increasing. In order to meet these
21 obligations in the least cost manner while continuing to provide reliable electric
22 generation to our customers, DEP continually tests these new and improving
23 emissions-reducing chemicals at its coal-fired plants with the hopes of eventually

1 using them to more efficiently reduce emissions.

2 The quantity of chemicals consumed in these emission-reduction processes
3 varies depending on the generation output of the unit, the chemical constituents in
4 the coal being burned, and the level of emission reduction required. Station
5 operators monitor each of these parameters to ensure that the equipment is being
6 operated in an efficient and effective manner.

7 SCR equipment is also an integral part of the design of the Lee CC Station
8 and will likewise be employed at Sutton CC. Similar to coal-fired SCR equipment,
9 the specific purpose is to reduce NO_x from the flue gases to meet environmental
10 regulations. Aqueous ammonia (19% solution of NH₃) is introduced in the flue gas
11 in the presence of a catalyst and excess oxygen for NO_x removal. The Company's
12 current forecast does not anticipate the need for ammonia at the CC facilities for
13 environmental compliance in the near term.

14 **Q. HOW DOES DEP MANAGE THE COSTS OF THESE EMISSION-**
15 **REDUCING CHEMICALS?**

16 A. The Company's objectives in procuring emission-reducing chemicals and managing
17 the resulting by-products are to provide the stations with the most effective total cost
18 solution for operation of the unit, understand the technical capabilities of the
19 equipment, assess emission-reducing chemical input and by-product output over the
20 long-term, analyze the markets for those chemicals and by-products, and look for
21 leverage opportunities with the chemical purchases and by-product sales contracts
22 between stations and with other Duke Energy subsidiary operations. Overall, DEP
23 is managing the impacts of all chemicals used to reduce emissions, favorable or

1 unfavorable, as a result of changes to fuel mix and/or changes in coal burn (as
2 discussed by Company witness Weintraub) due to competing fuels. Company
3 witness Babcock provides the cost information for DEP's chemical use and forecast.

4 **Q. DOES THAT CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

5 A. Yes, it does.